quently are in such deep shock that some of these symptoms and signs may not be obtained. I then take the history of the injury into consideration and explore immediately if the injury has been due to a fall from a considerable height or if the vehicle or body producing the blow was of fair weight. By adhering to this rule in a period of four weeks I opened the abdomen successfully in the additional cases, all under ten years of age, finding the following:

1. Rupture of the spleen; sutured; recovery.
2. Rupture of the liver; packed; recovery.
3. Rupture of the internal coats of the stomach, evidenced by two large hæmatoma, in its wall, and accompanied by vomiting of pure blood. Recovery.
4. One of my associates, Dr. J. E. Kelly, assisted by myself, operated in one case of ruptured and fragmented spleen, doing a splenectomy with recovery.
5. One of our assistants, Dr. A. E. Sellenings, operated in a case of ruptured liver, packing, with recovery.

REPORT OF A CASE OF AN EXTENSIVE BURN OF THE THIRD DEGREE.

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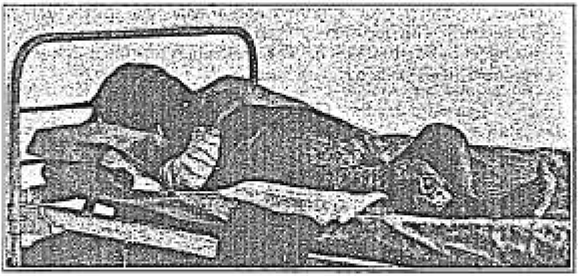
The case is that of Moses Seattle, an Indian dwarf, the last of the tribe of Seattle, and the grandson of the famous Indian chief, Seattle, for whom the present city of Seattle is named. He was thirty-four years old, a trifle over four feet high, and had a local reputation for consuming large quantities of "fire-water" whenever it was within his reach.

The history of the accident is rather obscure, but from the statements made by the patient before death, it is believed that he, in company with a few others, was drinking in a small hut not far from the Indian Reservation at Port Madison, Washington, when he became very much under the influence of the liquor and fell asleep. While he was in this condition the small house caught fire, presumably from the fire on the hearth, and the only thing the patient remembered was suddenly finding himself struggling through the flames in his effort to escape (Fig. 1).

This happened on the night of February 4th, and when found, two days later, he was brought to the town of Charleston, just outside the navy yard, and deposited in a barn. Hearing of his condition, I went out to see him on the morning of February 7th, and found him in a very bad way. After removing the dirty cloth covering the burn, I found that the latter was of the third degree, and included nearly all of the skin over the abdominal area from the seventh rib downward. The outer surface of the right thigh and buttock and portions of the right leg were also deeply charred. The dorsal surface of the penis was involved, and a circular wound, an inch in diameter, was found just below and to the right of the umbilicus and penetrating almost to the peritoneum. The latter wound is supposed to have resulted from falling on the sharp point of something in his effort to escape. He presented evidence of still being under the influence of liquor, and under his coat, which was used for a pillow, was found a pint-flask about three-quarters empty.

FIG. 1.



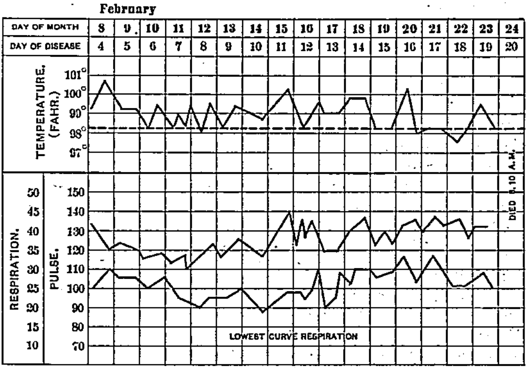
Just before my arrival a doctor in the neighborhood had administered two doses of morphine, $\frac{1}{4}$ grain each, and the patient was comparatively free from pain. His pulse when first seen was 130, weak and irregular, but considerable improvement was noted after a pint of black coffee had been introduced into the rectum. Adjoining the stable was a small stove-heated room, which was pressed into service as a dressing-room. Here the burned area was thoroughly washed with soap and warm water, and boric-acid ointment applied. Lint and cotton completed the dressing.

After rendering first aid, an effort was made to interest the people of the neighborhood in behalf of the patient, but no one would receive him; so, for the present, there was nothing to do but to continue treatment in the barn, in which there were also quartered some five or six horses. He was made as comfortable as the unwholesome conditions would permit, and, after an injection of $\frac{1}{20}$ grain of strychnine, he was left in charge of Frank N. Kannapell, the hospital steward from the U. S. R. S. *Philadelphia*, whose untiring attention to the sick man is worthy of note.

I was summoned from the ship about 4 o'clock in the afternoon of the same day, with the information that the patient was dying.

Having provided myself with the means for giving an intravenous infusion of normal salt solution, I hastened to the barn and found the patient apparently in a moribund condition, the pulse being so rapid that it could not be counted. Strychnine, $\frac{1}{20}$ grain, was administered, and, after a hurried effort to sterilize the left elbow, the median basilic vein was opened, and a little over a pint of normal salt solution introduced. The patient's condition began to improve almost immediately, and before I left the barn his pulse was 130, regular, and of perceptible volume. He remained in the barn overnight in charge of Hospital Steward Kannapell and Hospital Apprentice Houser, who alternated in standing watch by the sick man, and two doses of strychnine, $\frac{1}{20}$ grain each, were administered during the night.

The next morning, February 8th, Surgeon D. N. Carpenter, United States Navy, in command of the Naval Hospital, was communicated with, and consented at once to admit the patient to the hospital. His condition being favorable, he was removed to the hospital on a stretcher and placed in a boric-acid bath (3 per cent.), which was maintained continuously at about 38 C., and the dressing allowed to soak off. He remained in the bath for ten consecutive days, being only removed now and then to allow the tub to be cleaned, and each day the wound was examined and portions of the sloughing tissue removed. The accompanying chart shows the patient's temperature, pulse, and respiration during his stay in the hospital (see Chart).



On the second day he became tympanitic for the first time, and this condition was one of the distressing features of the case throughout his illness. At first the passage of the rectal tube and the introduction of an enema of salts, glycerin, and turpentine brought away large quantities of gas and some fecal matter. Later on we found 2 drops of turpentine administered by the mouth three times a day proved very effective in preventing intestinal fermentation and keeping the bowels open. The kidneys were closely watched each day, and though, as a rule, the output of urine was found satisfactory, toward the last albumin was present, sometimes in quantity.

His pulse for the first seven days showed no signs of impending danger, but on the night of February 15th it reached 140, and became very weak and fluttering. A little over a pint of normal salt solution was again introduced into his venous system, this time through the median basilic of the right elbow. The patient revived and was put back into the tub in fairly good condition. Now and then throughout his sickness he received hypodermic injections of strychnine and brandy.

When first placed in the bath the patient was restless and unable to sleep, and, at times, in considerable pain. This condition was met with morphine, from ⅛ to ¼ grain, but it was recognized from the first that if the atony of his bowels was to be relieved, he should be allowed only the minimum dose consistent with the pain present. He would sometimes go for whole days and nights at a time without requiring it.

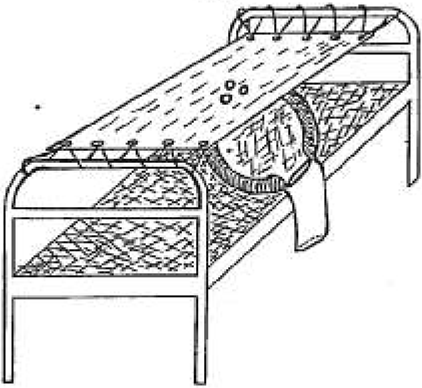
His food consisted principally of milk, beef-tea, albumen-water, orange-juice, and, at times, egg-nogg or brandy and milk. The amount of whiskey consumed per diem was gradually increased, as it was thought from his previous habits his system would miss the sudden withdrawal. The patient's marked dislike for milk and the unsatisfactory rectal feeding led us at times to deviate from the above diet, such as ordering milk-toast or very soft eggs, but it invariably resulted in distressing tympany. At one time the distention was so great that the liver was pushed up so far as to considerably embarrass the heart and respiration.

When the sloughing process had manifested itself in earnest, the patient was removed from the tub and continuous warm bichloride irrigation, 1:5000, resorted to by allowing the warm solution to trickle upon the compresses. A serious objection to this technique was that it kept the patient awake and but partially covered, and, on account of the sinking in of the middle of the mattress, caused the accumulation of the solution in the rubber pad under the patient. We hit upon a device which seemed to obviate these difficulties very nicely. It consisted in removing the mattress and stretching a piece of heavy canvas across the bed, about a foot and a half above the springs, and lashing the ends of the canvas to the top of the head-piece and foot-piece, respectively. Three small holes in the centre of the canvas allowed the solution to drain off at once into the rubber pad which was placed upon the springs below the canvas (Fig. 2).

In addition to this a fenestrated rubber tube was incorporated in the compresses over the wound and secured with a few turns of a roller bandage, and, after passing through a small hole in the blanket, communicated, by means of a short glass tube, with the rubber tubing leading from the irrigator. In this way the patient was relieved of the annoyance of the drop method, was completely covered, and the dressing over the entire wound kept moist. The patient expressed himself as being perfectly comfortable, and shortly afterward passed into a sound sleep, from which he awoke feeling much better.

The amount of skin involved was just about one-half of the body surface, if anything a little more, and he was apparently doing remarkably well for the extensive injury he sustained, but at 6.10 A.M., on February 24th, he suddenly expired, having been in the hospital sixteen days. The nurse on watch stated that the patient was talking cheerfully a few moments before, when he suddenly noticed the change in his condition, which proved to be death.

FIG. 2.



Autopsy, 1.55 P.M., February 24, 1905. Body a trifle over four feet long and somewhat wasted. Rigor mortis well marked. Muscular development good. Deformity of extremities and head (ostitis deformans or rachitis). Granulating surface of extensive burn covering entire right abdomen, pubes, and dorsal surface of penis. Right buttock and loin, as far as spine, involved. Burned area extending irregularly over left abdomen. Also over upper and outer surface of right thigh and leg. A few sloughs remain, but on the abdomen effort to heal is seen along the edges, which are covered by young skin extending one-half to one inch on to the surface of the burn.

Thorax. Bloody exudation (about 500 c.c.) in both pleural cavities. Lungs normal, except for slight adhesions of the right lung. Pericardial fluid normal.

Heart. Left ventricle slightly hypertrophied. Right ventricle dilated, showing fatty changes in muscle. A large white ante-mortem clot occupying the ascending aorta and extending into the arteria innominata, bifurcating into left common carotid. Valves of heart normal.

Abdomen. Large and small intestines markedly distended with gas, and walls thin. Upper portions of small intestines congested and about 1000 c.c. of greenish exudate in peritoneal cavity. Parietal peritoneum beneath burn shows, macroscopically, no exudate or inflammatory change.

Stomach distended, but apparently normal. Duodenum congested but no *ulcers* or evidence of *marked inflammation* found, save for the adhesions of omentum to stomach, duodenum, and spleen.

Spleen. One-half usual size, but apparently normal.

Kidneys. Enlarged. Evidence of fatty changes. (Diffuse nephritis.)

Liver. Enlarged and fatty. Pushed up against diaphragm and encroaching considerably upon the heart and right lung.

The post-mortem findings, including a large white thrombus occupying the ascending aorta and extending into the arteria innominata, indicate that death resulted directly from asthenia due to the sudden embarrassment of an already overtaxed heart.

This was brought about by a rapid distention of the stomach and intestines with gas, pushing up the liver and diaphragm, and thus seriously hampering the heart's action, which also had to cope with the large ante-mortem clot in the aorta. The hypertrophied left heart had compensated, as far as possible, for the extra work thrown upon it by having to force the blood passed the large thrombus, but being already weakened, and finding itself suddenly in very cramped quarters, it was unable to keep up the struggle, and hence collapsed.

The continuously rapid pulse is also explained in that only a relatively small quantity of blood could be forced past the thrombus at each contraction of the ventricle, and hence there had to be a greater number of contractions to make up for the lack in volume that passed through the aorta during systole.

Had not the thrombus been present, it is reasonable to predict that the patient would have recovered, as far as the immediate results of the burn were concerned, although considerable skin-grafting would have been indicated for a complete recovery.

A review of the case presents many instructive points, which are also confirmed by the writer's previous experience with a number of extensive burns resulting from the explosions on the U. S. S. *Massachusetts* and the U. S. S. *Missouri.*

1. All extensive burns should be treated, if possible, by the continuous warm bath. This method is very restful to the patient, relieves the existing shock, and attention can be given to the burned area without handling the patient or removing dressings, both of which operations are always attended by more or less shock and no little pain.

2. When the sloughs have begun to separate, some form of more active continuous antiseptic irrigation, preferably aluminum acetate, is indicated. (The aluminum acetate could not be obtained for this case, and corrosive sublimate was used instead.)

3. The apparatus mentioned above is recommended as meeting all the requirements. The patient rests comfortably upon the stretched canvas, and the solution does not accumulate beneath him. The fenestrated tube has obvious advantages over the continuous drop method.

4. While food is essential, it should be strictly liquid, and given in small but repeated doses. For the accumulation of gas in the intestines, which almost invariably occurs when the abdomen is involved, turpentine, in small doses, is strongly recommended, though the kidneys may be slightly diseased. The rectal tube is, of course, a useful adjunct.

5. For the shock, which is always present in extensive burns, besides the well-known methods for combating it, the intravenous infusion of normal salt solution will give oftentimes miraculous results.

6. Extensive burns, of even over one-half the body surface, should not be despaired of, as I am of the opinion that heretofore the profession has been too prone to regard as hopeless a burn involving extensive areas. As a result of this, we are liable to neglect, or regard as useless, some of the methods and technique which, at least, should be given a fair trial when it is possible to do so.

In concluding this paper, I wish to state that Surgeon D. N. Carpenter, at whose suggestion this report is made, was associated with me throughout in the management of the case. That the patient lived as long as he did is due to the praiseworthy promptness with which he was admitted to the hospital by Dr. Carpenter, as well as to his valuable suggestions and judgment in the conduct of the case.